



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Minoru KOTATO, et al.

SERIAL NO: 09/926,779

GAU: 1745

FILED: May 28, 2002

EXAMINER:

FOR: NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

Applicant(s) wish to disclose the following information.

FEB 24 2004

REFERENCES

- ☐ The applicant(s) wish to make of record the references listed on the attached form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- ☐ A check or credit card payment form is attached in the amount required under 37 CFR §1.17(p).

RELATED CASES

- ☒ Attached is a list of applicant's pending application(s) which may be related to the present application. A copy of the claims and drawings of the pending application(s) is attached.
- ☐ A check or credit card payment form is attached in the amount required under 37 CFR §1.17(p).

CERTIFICATION

- ☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.
- ☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

DEPOSIT ACCOUNT

- ☒ Please charge any additional fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to deposit account number 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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MAIER & NEUSTADT, P.C.

A handwritten signature of Norman F. Oblon, written in dark ink over a horizontal line.

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LIST OF RELATED CASES

<u>Docket Number</u>	<u>Serial or Patent Number</u>	<u>Filing or Issue Date</u>	<u>Inventor/ Applicant</u>
217552US-0-PCT*	09/926,779	5/28/02	KOTATO, et al.
245549US-0-X CONT	10/718,711	11/24/03	KOTATO, et al.

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\*Present Application; listed for information  
NFO/amr

# CLAIMS

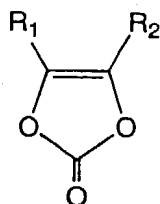
1. A non-aqueous electrolytic secondary battery comprising at least:

5 an electrode group having a positive electrode, a negative electrode which contains a material being capable of storing and releasing lithium ions, and a separator disposed between the positive electrode and the negative electrode; and

10 a non-aqueous electrolytic solution containing a non-aqueous solvent(s) and a lithium salt dissolved in the non-aqueous solvent, with which the electrode group being impregnated, wherein

(1) the electrode group is contained in a casing made  
15 of a sheet having a resin layer with a thickness of 0.5 mm or less,

(2) the non-aqueous solvent contains  $\gamma$ -butyrolactone, ethylene carbonate, at least one vinylene carbonate compound represented by the formula (I):



(I)

20

wherein R<sub>1</sub> and R<sub>2</sub> each independently represent a hydrogen atom or an alkyl group having 1 to 4 carbon atoms,

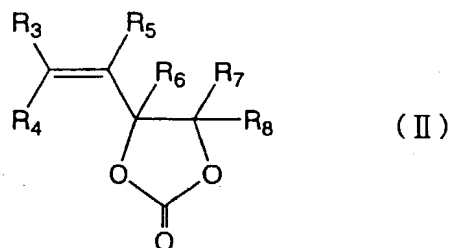
and at least one vinylene carbonate compound  
25 represented by the formula (II):

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- wherein  $R_3$ ,  $R_4$  and  $R_5$  each independently represent a hydrogen atom or an alkyl group having 1 to 4 carbon atoms, and  $R_6$ ,  $R_7$  and  $R_8$  each independently represent a hydrogen atom, an alkyl group having 1 to 4 carbon atoms or an alkenyl group having 2 to 7 carbon atoms,
- (3) the amount of the vinylene carbonate compound is 0.01 to 5 % by weight based on the total weight of the non-aqueous solvent, the amount of the vinylethylene carbonate compound is 0.01 to 5 % by weight based on the total weight of the non-aqueous solvent, and the total amount of the vinylene carbonate compound and the vinylethylene carbonate compound is 0.02 to 6 % by weight based on the total weight of the non-aqueous solvent, and
- (4) the amount of the  $\gamma$ -butyrolactone is 50 % by volume or more based on the total volume of the non-aqueous solvent and the amount of the ethylene carbonate is 10 % by volume or more based on the total volume of the non-aqueous solvent.
2. A non-aqueous electrolytic solution for a secondary battery,

where the secondary battery has at least:

- an electrode group having a positive electrode, a negative electrode which contains a material being capable of storing and releasing lithium ions, and a separator disposed between the positive electrode and the negative electrode, the electrode group being contained in a casing made of a sheet having a resin layer with a thickness of

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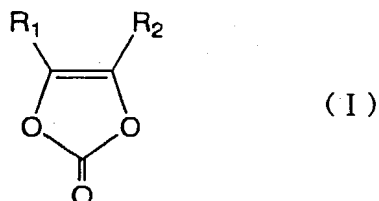
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0.5 mm or less; and

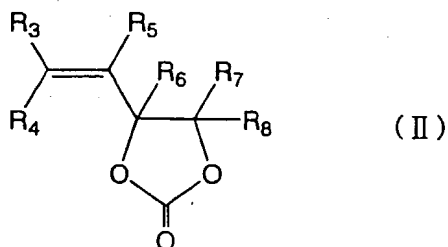
a non-aqueous electrolytic solution comprising a non-aqueous solvent(s) and a lithium salt dissolved in the non-aqueous solvent, with which the electrode group being  
5 impregnated, wherein

(1) the non-aqueous solvent contains  $\gamma$ -butyrolactone, ethylene carbonate, at least one vinylene carbonate compound represented by the formula (I):



10 wherein  $R_1$  and  $R_2$  each independently represent a hydrogen atom or an alkyl group having 1 to 4 carbon atoms,

and at least one vinylene carbonate compound represented by the formula (II):



15 wherein  $R_3$ ,  $R_4$  and  $R_5$  each independently represent a hydrogen atom or an alkyl group having 1 to 4 carbon atoms, and  $R_6$ ,  $R_7$  and  $R_8$  each independently represent a hydrogen atom, an alkyl group having 1 to 4 carbon  
20 atoms or an alkenyl group having 2 to 7 carbon atoms,  
(2) the amount of the vinylene carbonate compound is 0.01 to 5 % by weight based on the total weight of the non-

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aqueous solvent, the amount of the vinylethylene carbonate compound is 0.01 to 5 % by weight based on the total weight of the non-aqueous solvent, and the total amount of the vinylene carbonate compound and the vinylethylene carbonate compound is 0.02 to 6 % by weight based on the total weight of the non-aqueous solvent, and

(3) the amount of the  $\gamma$ -butyrolactone is 50 % by volume or more and the amount of the ethylene carbonate is 10 % by volume or more based on the total volume of the non-aqueous solvent.

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ASBSTRACT

A non-aqueous secondary battery having an electrode group and a non-aqueous electrolytic solution,

5 characterized in that :(1) the electrode group is contained in a casing made of a sheet having a resin layer with a thickness of 0.5 mm or less, (2) the non-aqueous solvent contains  $\gamma$ -butyrolactone, ethylene carbonate, at least one vinylene carbonate compound and at least one vinylethylene

10 carbonate compound, (3) the amounts of the vinylene carbonate compound, the vinylethylene carbonate compound and sum total of both are, respectively, 0.01 to 5 % by weight, 0.01 to 5 % by weight and 0.02 to 6 % by weight, based on the total weight of the non-aqueous solvent, and

15 (4) the amounts of the  $\gamma$ -butyrolactone and the ethylene carbonate are, respectively, 50 % by volume or more and 10 % by volume or more, based on the total volume of the non-aqueous solvent.

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Fig.1

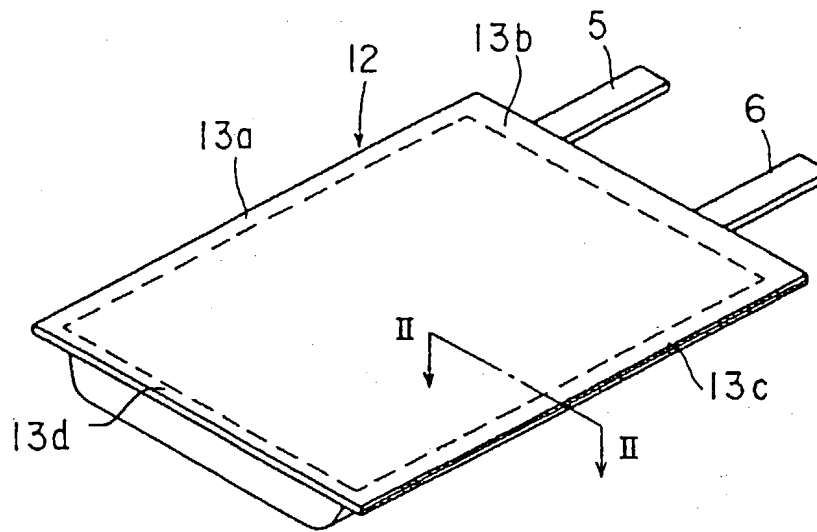


Fig.2

